OPTIMIZED MONOVISION: GREATER DEPTH OF FOCUS WITH FEWER COMPROMISES

RayOne EMV adds a versatile option for individualizing the approach to presbyopia correction.

BY WILLIAM F. WILEY, MD

When Rayner released the RayOne EMV lens, our practice chose to be one of the early adopters of the technology. Although new to the market, the EMV lens is delivered via the patented RayOne injector which we have used with other Rayner lenses for the past couple of years. That instantly gave us confidence that it would be easy to use in the OR, and thus, easy to integrate.

As we looked deeper into the design characteristics of the EMV optic and assessed how those considerations would translate to performance, we came away with the impression that the technology would enhance our ability to individualize presbyopia correction. RayOne EMV, which is engineered to deliver greater depth of focus than a standard monofocal IOL, is the first lens that has been specifically optimized for use in monovision settings. With this lens, the surgeon can truly customize the overall correction depending on the patient's visual goals and refractive target.

Employing monovision has historically entailed asking patients to compromise a bit of distance acuity to achieve greater near, or vice versa. RayOne EMV addresses this shortcoming by inducing a hyperopic shift that maintains stereoacuity, keeping distance acuity high and reducing asthenopia. We are early in our experience with the lens, but so far, patients have been very happy with the near, intermediate, and distance vision they have been able to achieve.

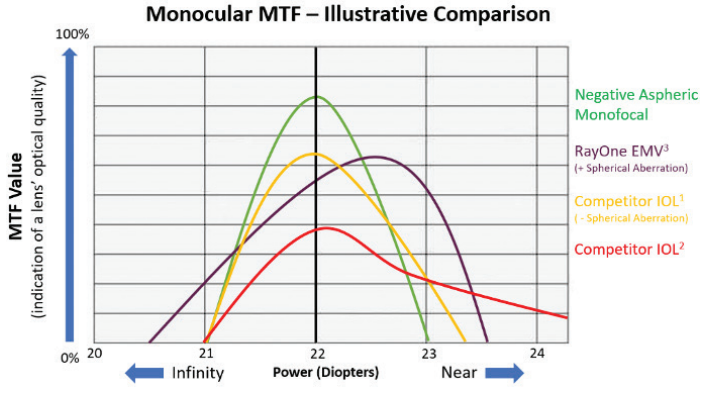

Figure 1. Illustrative comparison of modulation transfer function (MTF) curves. Compared to a negative aspheric monofocal, the RayOne EMV provides only slightly less power for distance, but much more useful vision at the intermediate range for activities like computer viewing.

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TECHNICAL CONSIDERATIONS

When looking at the lens itself, the surgeon will notice no difference in the appearance of RayOne EMV compared to a standard monofocal. However, there are some important characteristics of the optic that are worth noting. RayOne EMV is designed to induce positive spherical aberration in the center with a blended edge region that gradually reduces longitudinal spherical aberration to maintain contrast in the peripheral viewing area. These considerations function to increase the range of functional vision while minimizing the potential for dysphotopsia at all pupil sizes. In benchtop testing, RayOne EMV has been shown to provide 1.25 D of extended range of vision on average compared to a standard monofocal IOL also targeting emmetropia (Figure 1).

Fundamentally, RayOne EMV increases the range of functional vision by complementing the eye's natural positive spherical aberration, which is a different mechanism than lens options with a central zone powered for distance. This difference has importance when considering which lens to match with the patient. For example, lens options with a central distance zone require greater surgical precision to achieve the extended depth of focus being offered; they are also more sensitive to decentration and tilt and less forgiving of missed target refraction. Thus, patients who are unlikely to tolerate compromises associated with multifocal lenses, including visual disturbances and potential for diminished contrast, might be better suited for a monovision arrangement with RayOne EMV.

From a strict optical perspective, there are other lens options that offer greater near or distance vision. Yet, how RayOne EMV lenses perform in a monovision setting translates to a greater

ability to achieve the right outcome for the individual patient—not only in terms of the final vision, but also in terms of satisfaction. Because of the unique manner in which RayOne EMV extends the focal point, there is a smoother transition between the dominant and non-dominant eye when compared to a monovision arrangement with standard monofocals (Figure 2). Functionally, this means that even with an offset of 0.75 D to 1.50 D, the near eye still contributes to distance vision, and it also provides superior intermediate vision compared to a standard monofocal IOL.

CUSTOMIZING THE APPROACH TO MONOVISION

The nice thing about having a lens option that extends the functional range of vision is that it offers flexibility and versatility for addressing each patient's unique circumstance depending on their vision goals and how each eye is targeted. Although optimized for monovision, RayOne EMV performs well in situations where emmetropia is targeted in both eyes. A patient who does not mind the occasional use of spectacles for near vision may be a good candidate for such an approach. Just like standard monovision, they are likely to achieve functional near and distance viewing, although the bilateral use of RayOne EMV lenses will result in greater intermediate vision.

In our experience, we encounter a lot of patients who want to achieve less dependence on glasses while addressing their presbyopia. There are, indeed, a wide range of options for these kinds of patients, up to and including multifocal IOLs. What RayOne EMV potentially provides for these kinds of patients is a reduced chance of visual side effects. And the truth is, we also do not necessarily have to have the entire surgical plan for both eyes set in stone from the start of the patient's journey through cataract surgery.

We typically start by implanting the dominant eye, targeting the best possible distance vision—typically minus a quarter diopter. When we see the patient back, we can then assess how they are doing with their vision. In some cases, the patient is satisfied with their vision, and we can proceed using a matched power lens in the non-dominant eye. More frequently, the patient reveals that he or she is pleased with distance viewing but would like a little more near or intermediate power, in which case we can use a lens in the contralateral eye to achieve a monovision arrangement. The latter approach is analogous to blended vision achieved with LASIK or corneal refractive surgery, where we achieve a monovision arrangement without a large degree of offset between the two eyes. In our first experiences with the lens, we have been dialing in -0.50 D to -1.50 D of offset and have seen great results so far, although a wider offset is certainly possible.

INTRODUCING RAYONE EMV TO PATIENTS

Helping patients address their presbyopia with a monovision set-up is a mix of science and art. On the one hand, achieving the desired postoperative refractive target entails careful consideration of the optical principles being leveraged. With a positive spherical aberration lens technology like RayOne EMV, use of topography and ability to interpret findings are key starting points. It is necessary to listen closely to the patient and truly understand the vision he or she wants to achieve after surgery in order to design a plan likely to achieve the desired quantity and quality of vision.

We are finding with RayOne EMV that our patients are achieving the blend of distance and near associated with using standard monofocals in a monovision arrangement, but with greater intermediate vision and without the visual compromises associated with multifocal IOLs. ■

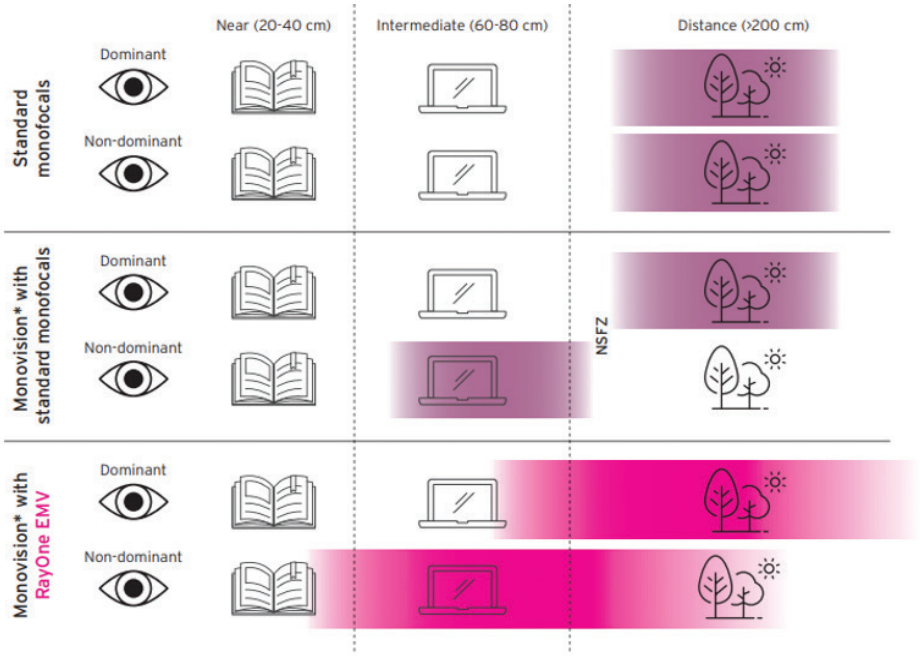

Figure 2. A monovision arrangement with RayOne EMV lenses with a 1.00 D offset results in a wide range of binocular vision, as indicated by the area of crossover between the dominant and non-dominant eyes. With standard monofocal lenses using the same offset there is a noticeable gap in between distance and near, labeled as the "not sharply focused zone" (NSFZ), which patients may report as blurry computer vision. In terms of the amount of binocular viewing achieved with bilateral RayOne EMV IOLs and a 1.00 D offset, the non-dominant eye functionally extends the overall distance, in essence providing two eyes for distance and one eye for near.

WILLIAM F. WILEY, MD
- Private practice, Cleveland Eye Clinic, Ohio
- *CRST* Executive Advisor
- Chief Medical Editor, *CollaborativeEYE*
- drwiley@clevelandeyeclinic.com
- Financial disclosure: Rayner